

Important names in rotor dynamics



Henry F. Black, 1928 to 1980, left a lasting legacy as a brilliant rotor dynamicist and a great communicator.

Black came to Britain from Vienna in 1938. He attended a Catholic boarding school for a few years, where mathematics and science subjects were poor or nonexistent. When he transferred to a grammar school, he improved sufficiently in mathematics to win a scholarship. He was a very talented pianist who surprised everyone when he said he wanted to be an engineer. He became interested in Mechanical Engineering because it was a good way to combine math, physics, and satisfy his curiosity for how things worked.

Henry graduated with honors in Mechanical Engineering from the University of London in 1949. He worked at Bristol Aeroplane Company on vibration analysis and at British Celanese until he took a post as a lecturer at the then Heriot-Watt College in Edinburgh, Scotland, in 1952. The university was his natural home, although he enjoyed working as a consultant for the high technology companies, including work on the space shuttle engine for NASA and Rocketdyne.

His development of comprehensive models of pumps and the solutions of the resulting equations was a world-class scientific achievement. Black did pioneering work in the dynamics of impeller seals, high speed pumps with water or process-fluid lubricated bearings, and analyzed passive and active tank stabilizers for ships unable to use fin stabilizers.

According to Don Bently, "He was the smartest man I ever met. He had a good understanding of oil whirl, as it was known at the time. He told me he

knew there was another resonance. He knew the root was there... I saw him use it, he explained to me how to use it... but he didn't know about the direct and quadrature roots and so didn't use them to solve problems."

He could identify the essence of a problem with ease and describe it in the most fundamental mathematical terms, without the need to resort to the massive number-crunching computer methods (he felt that finite element methods obscured the physics, thus the understanding, of a problem). He was an absolute genius at partial differential equations. He would stare at them for a few moments and then write down the answer. One of his research students complained that it took him the best part of a month to check it longhand. Black was quite pleased that the modal analysis programs based on his mathematics were at least as effective, and more computationally efficient, as the finite element methods for prediction of rotor motion. The modal separation program demonstrated that the vibration modes of a flexible rotor could be twisted in three-dimensions, as he had predicted.

Black was the central figure of a lively research group, a tremendous leader who treated his research assistants and staff very well, supported them, and created the right working environment. He rarely gave instructions, just suggestions or hints, as if from a friend. He was a great communicator, his enthusiasm was infectious, and he gladly helped and tutored his colleagues and others in his profession. He was clearly on the same wavelength as his students and the staff.

Black was successfully proposed for a Readership at Heriot-Watt in 1971, was given the lead in directing research activities, and was promoted to a Personal

Chair in the Mechanical Engineering Department in 1975. He graduated with the degree of D. Sc. in 1979.

His sense of humor, keen wit, and highly-developed sense of the ridiculous were well known. He once assured the head of the department that he was late because he'd been to a seminar on harmonic vibrations (gone to an organ recital). Somewhat the absent-minded professor, he once joined his wife coming home one day on the bus, and it was some time before they both realized he had driven the car that day.

He was asked to give a lecture to the medical staff at his hospital just weeks before his death. It was a brilliant lecture in which he demonstrated all the problems by showing what was going wrong with a bicycle. His wife Nancy commented for this biography, "What a waste that a few short weeks after this, a man of such ability and charm, who still had so much to contribute to society, was dead."

This short biography was compiled from the still vivid memories of Henry Black provided by his colleagues, students, and family. The comments made here were repeated by all of the contributors, so the editor has taken the liberty of not attributing authorship. There was unanimous agreement that Henry Black gave himself equally to the pursuit of knowledge, the advancement of his fields of research, and to all those who were fortunate to share his life. ☺

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